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B7B BSB

(56) Documents cited  
GB 2250963 A GB 0953312 A US 4262931 A

(58) Field of search  
UK CL (Edition L) B7B BSB  
INT CL<sup>5</sup> B60R  
Online database: WPI

**(54) Vehicle air bags**

(57) An air bag 62 for the knees of an occupant 62 is mounted in a position to the righthand side of the steering column 52, the air bag having such a shape as to extend to the other side of the steering column when deployed. The air bag has projections 62C, 62A which extend towards the vehicle seat 56, the knees of the occupant being received in the recessed portion 62B. Other offset positions for the air bag are described.

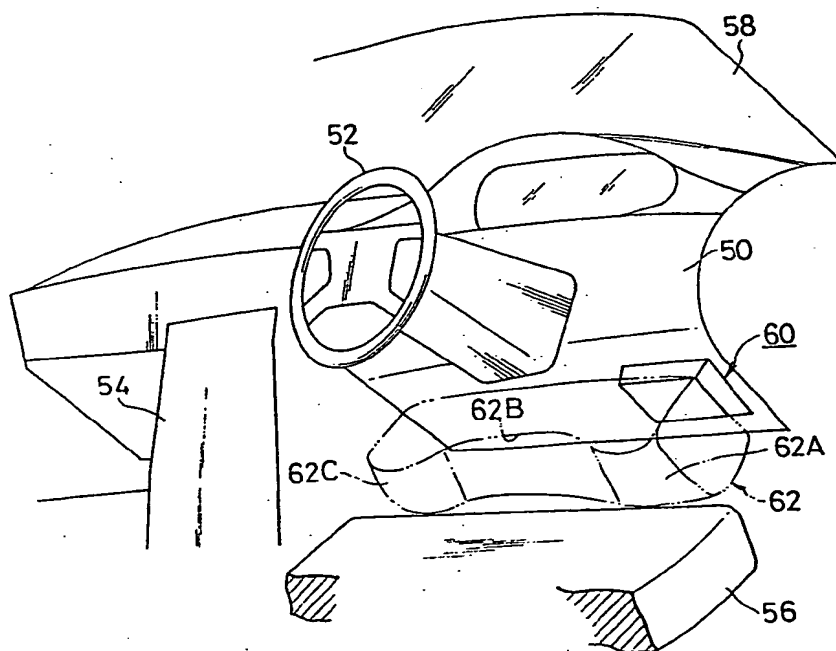


FIG.12

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FIG. 1

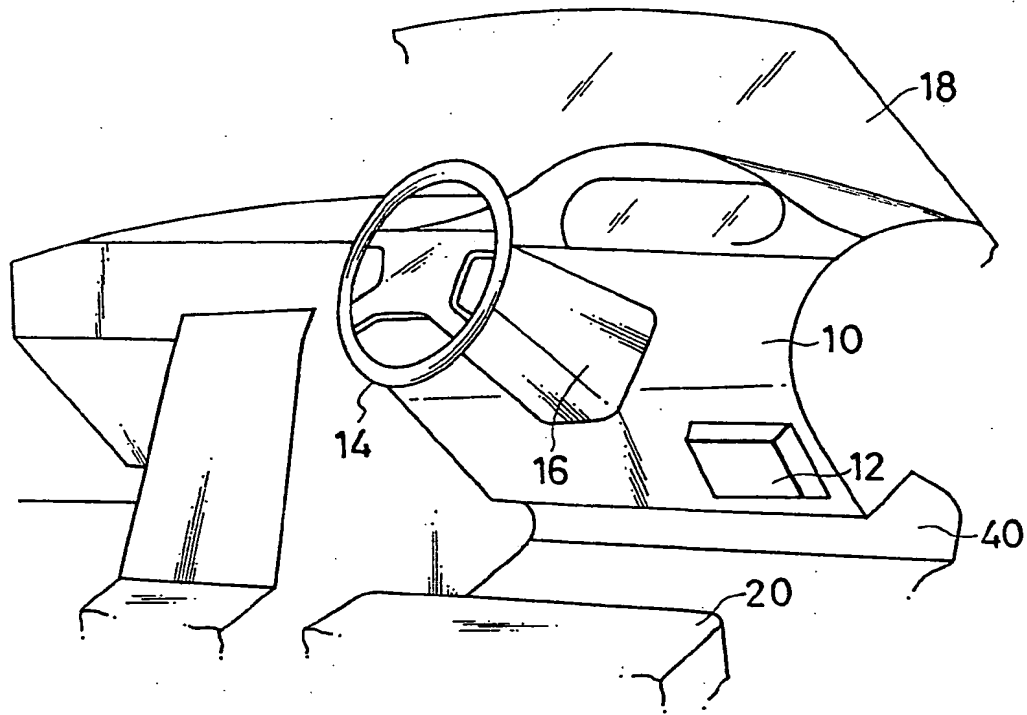


FIG. 2

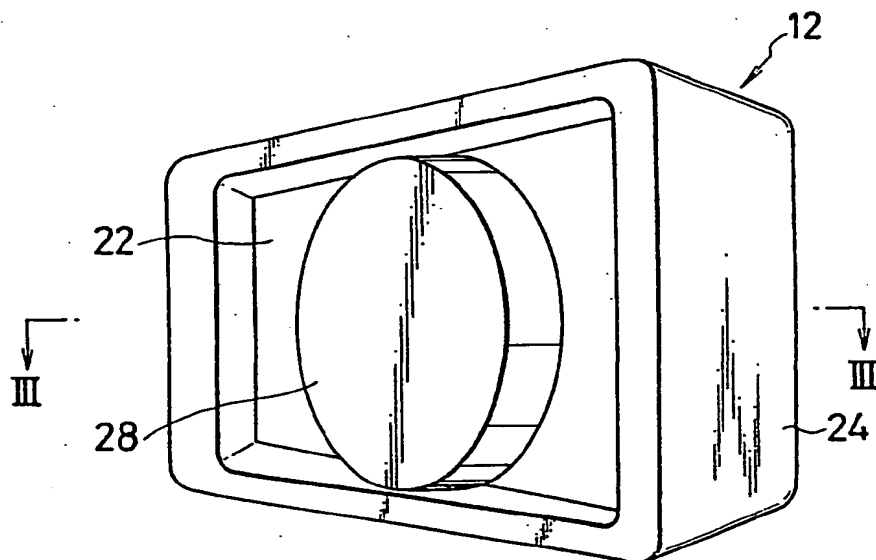


FIG.3

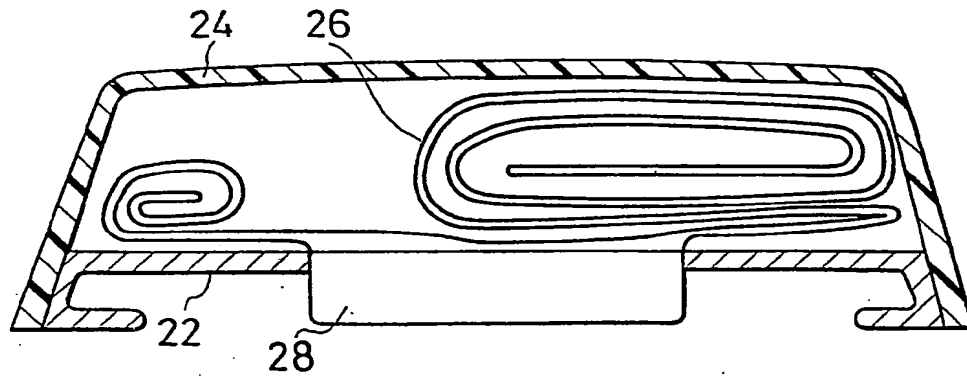


FIG.4

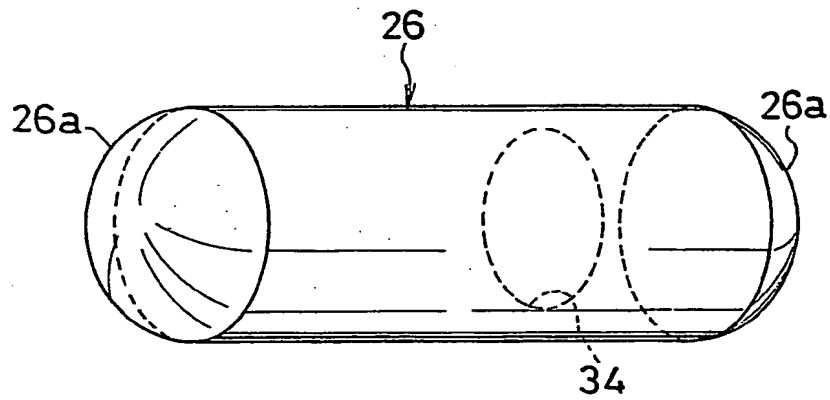


FIG.5

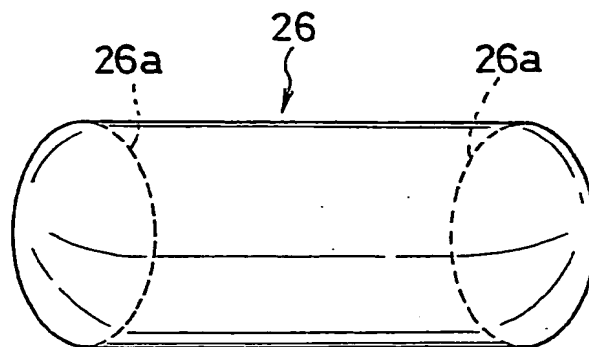


FIG. 6

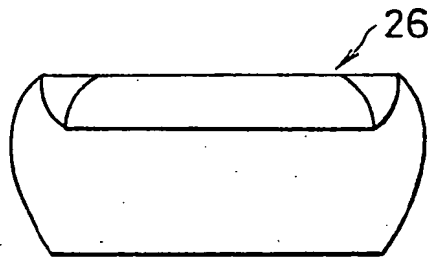


FIG. 7

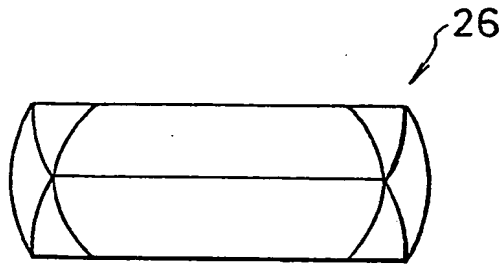
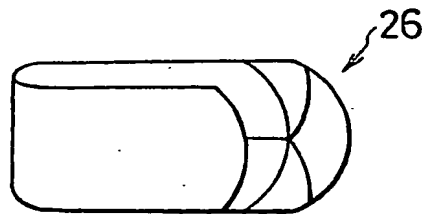


FIG. 8



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FIG.9

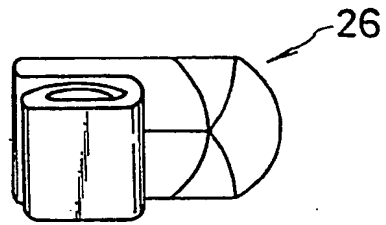


FIG.10

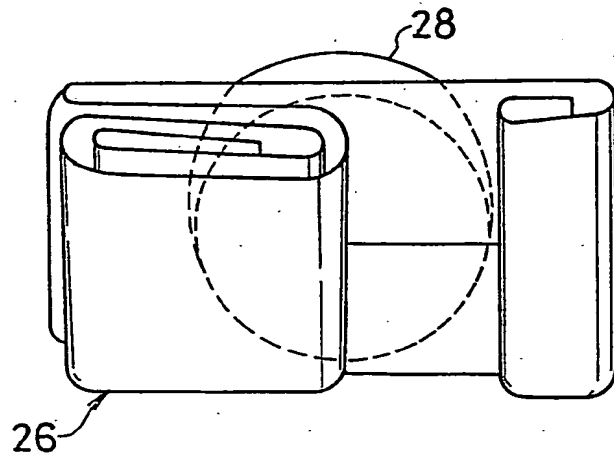


FIG. 11

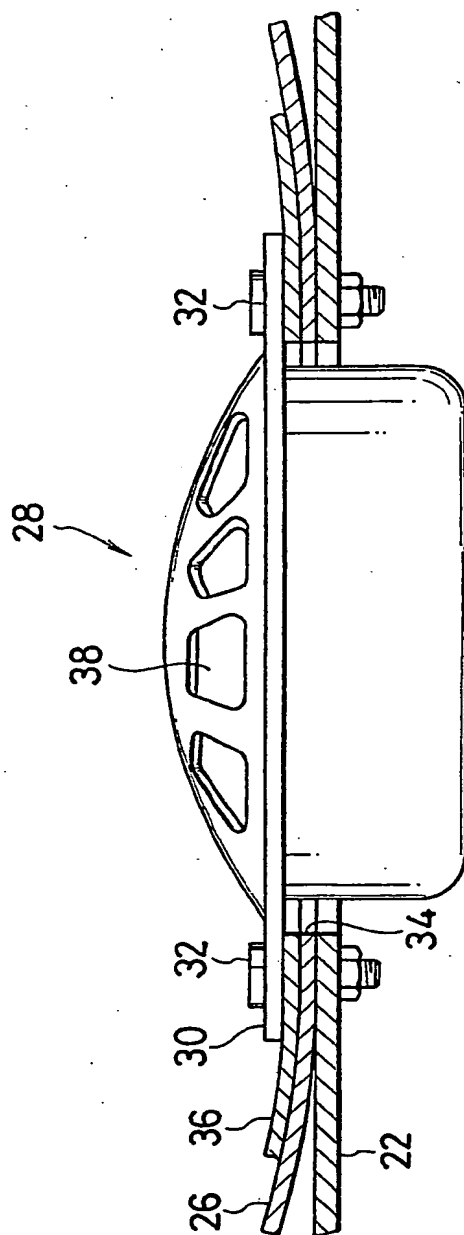


FIG.12

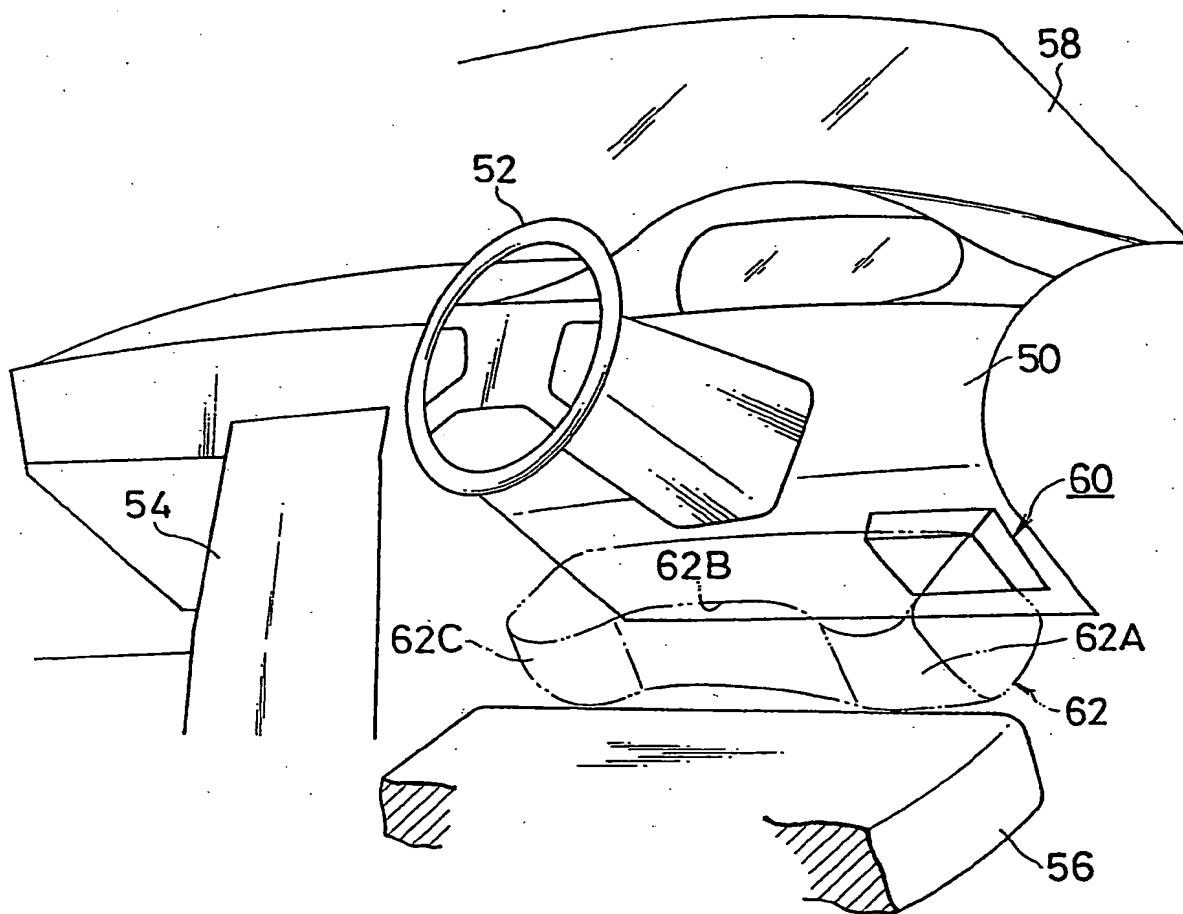


FIG.13

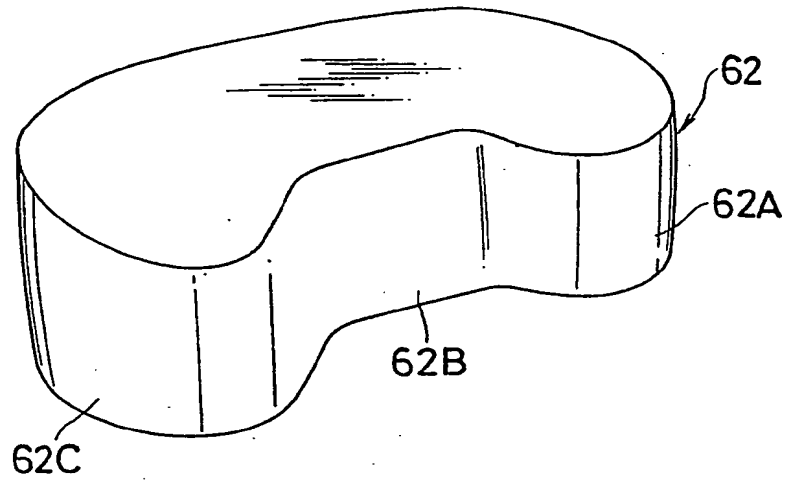
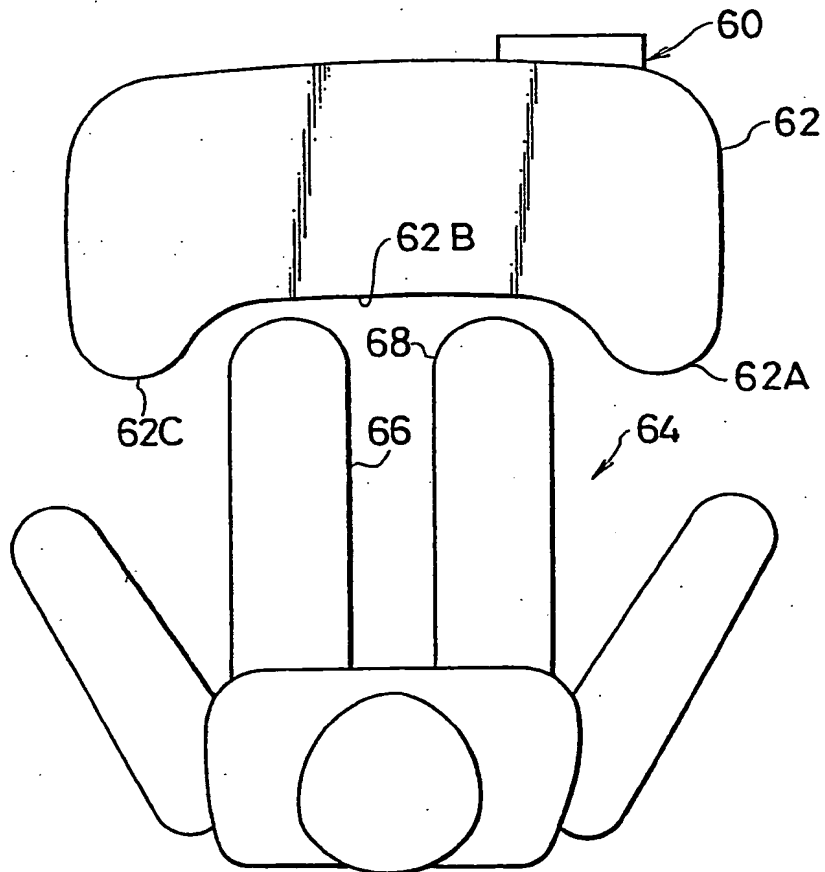


FIG.14



## S P E C I F I C A T I O N

## TITLE OF THE INVENTION

Air Bag Device for the Knees of an Occupant

## BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a device for protecting an occupant of a vehicle and, more particularly, to an air bag device for the knees of an occupant as called a "knee bag device".

Description of the Related Art

An occupant protecting device having an air bag (or a knee bag) to be extended in front of the knee of the occupant of a vehicle is disclosed in Japanese Utility Model Publication No. 24110/1972 and Japanese Patent Laid-Open No. 28050/1991. This knee bag can be extended to protect the lower half of the occupant by preventing the submarine motion of the occupant (i.e., the motion of the occupant's body into the front lower portion of the seat).

The occupant protecting devices, as known in the above-specified individual publications, have

their air bag devices arranged in front of the center of the seat. As a result, the air bag device is positioned near the knees of the occupant to raise the problem of lowering the comfort of the vehicle cabin. At the driver's seat, on the other hand, the steering column is located in the vicinity of the front of the seat center thereby to make it more difficult to arrange the air bag device.

In the knee bag device of the prior art, the air bag takes, when extended, a generally identical shape (i.e., the extended shape of the air bag) throughout the widthwise direction of the seat. With this extended shape, the occupant may have his or her legs parted, when his or her legs are advanced to the extended air bag. Namely, the right leg may slide rightwardly of the air bag whereas the left leg may slide leftwardly of the air bag so that the legs may be parted.

#### OBJECT AND SUMMARY OF THE INVENTION

According to a first aspect of the present invention, there is provided an air bag device for the knees of an occupant comprising an air bag adapted to be extended in front of a seat of a vehicle including a zone at a height of the seat, a casing which holds the air bag therein in a folded state, and a gas generator mounted on the casing, the casing being

located in a position offset to one of the righthand or lefthand sides of the front of the center of the seat, and the air bag having such a volume as to be extended to the other side by the gas generator.

According to a second aspect of the present invention, the air bag of the first aspect has a transversely long expandable shape and is formed at its back at one transverse end with an opening to be connected with the gas generator, and wherein the air bag has its longer side upper and lower edges folded back to the front thereof and its transverse other end folded back toward the one transverse end.

Since the air bag device according to this invention is disposed in a position offset rightward or leftward from the front of the center of the seat, the distance from the knees of the occupant to the air bag can be enlarged to widen the space around the knees of the occupant.

According to the air bag device of the second aspect, the air bag can be quickly extended in the zone in front of the center of the seat.

According to a third aspect of the present invention, there is provided an air bag device for the knee of an occupant, comprising an air bag adapted to be extended in front of a seat of a vehicle including

a zone at a height of the seat, a casing which holds the air bag therein in a folded state, and a gas generator mounted on the casing, the air bag having a shape when it is extended fully, in which its two end sides in the widthwise direction of the seat have projections toward the seat.

According to the air bag device of the third aspect, the air bag takes, when extended, a shape, in which its portion facing the center of the seat is recessed so as to receive the knees of the occupant thrown thereto. As a result, the occupant can prevent his or her legs from being parted.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of the inside of a vehicle and shows a device embodying the present invention;

Fig. 2 is a perspective view showing the back of an air bag device to be used in the embodiment;

Fig. 3 is a section taken along line III - III of Fig. 2;

Fig. 4 is a perspective view for explaining a method of folding an air bag;

Fig. 5 is a front elevation for explaining the air bag folding method;

Fig. 6 is a front elevation for explaining the

air bag folding method;

Fig. 7 is a front elevation for explaining the air bag folding method;

Fig. 8 is a perspective view for explaining the air bag folding method;

Fig. 9 is a perspective view for showing the air bag folding method;

Fig. 10 is a perspective view showing a folded air bag;

Fig. 11 is an enlarged section showing an essential portion of Fig. 3;

Fig. 12 is a perspective view showing the inside of a vehicle equipped with an air bag device according to another embodiment of the present invention;

Fig. 13 is a perspective view showing an exploded shape of the air bag of the device of Fig. 12; and

Fig. 14 is a top plan view showing an example of the operation of the device of the embodiment of Fig. 12.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will be described in the following in connection with the embodiments thereof with reference to the accompanying drawings.

In Fig. 1, an automobile is equipped with an air bag device 12 on the lower face of its instrument panel 10. A steering wheel 14, a cover 16 for a steering column, a front shield 18 and a driver's seat 20 are provided in the cabin of the vehicle. The steering wheel 14 and the steering column cover 16 are located in front of the center of the driver's seat 20. The air bag device 12 is offset rightward (as in the present embodiment) or leftward from the front of the seat center.

As shown in Figs. 2, 3 and 11, the air bag device 12 comprises a casing consisting of a retainer 22 and a module cover 24. An air bag 26 is arranged in a folded shape in the casing. The retainer 22 is provided with a gas generator 28 for extending the air bag 26.

The gas generator 28 has a flange 30 through which the gas generator 28 is fixed to the retainer 22 via bolts 32. The air bag 26 is fixed on the retainer 22 by having its opening 34 clamped at its edge portion between the flange 30 and the retainer 22. A reinforcing cloth 36 is stitched on the edge portion of the opening 34 of the air bag 26. The gas generator 28 has gas injection holes 38.

The air bag 26 takes, when extended, a transversely long shape, as shown in Fig. 4, and the opening 34 is arranged in the back of one of the transverse ends of the air bag when fully extended.

It will be detailed how the air bag 26 is folded with reference to Figs. 4 to 10.

First of all, projecting portions 26a at the two transverse ends of the air bag 26 are slightly folded inward, as shown in Fig. 5. Next, the air bag 26 has its one longer side folded back toward its surface side, as shown in Fig. 6. Then, the other longer side is folded back toward the surface side of the air bag 26, as shown in Fig. 7. As a result, the air bag 26 takes a transversely long shape in its entirety. Next, as shown in Fig. 8, the side opposite to the side formed with the opening 34 is folded back to the surface side of the air bag 26, and the leading end in the fold-back direction is so folded several times that it is wound in the same direction. As a result, a state of Fig. 9 is achieved. Thus, the transversely other end portion of the air bag 26 is then folded back toward the surface side of the air bag 26. As a result, the air bag 26 takes a compactly folded state, as shown in Fig. 10.

If the air bag 26 thus folded is confined in the casing, as shown in Fig. 3, it is quickly extended transversely when the gas generator 28 generates gases. As a result, even if the air bag device 12 is

arranged in the position offset from the front of the seat center, the air bag 26 is extended quickly all over the front area of the knees of the occupant when the vehicle collides. Since the air bag device 12 is thus arranged in the position offset from the front of the seat center, the space in front of the center of the seat 20 is widened to improve the comfort of the vehicle cabin.

Incidentally, the air bag 26 may preferably be equipped therein with straps so that it may be regularly extended in the transversely long shape shown in Fig. 4.

Although the air bag device 12 is arranged in the foregoing embodiment at the righthand side of the front of the seat 20, it may be disposed at the lefthand side of the front of the seat 20. In the embodiment, the air bag device 12 is disposed on the lower face of the instrument panel 10 but it may be disposed on a dashboard 40.

Another embodiment of the present invention will be described with reference to Figs. 12 to 14.

In Fig. 12, an instrument panel 50, a steering wheel 52, a console box 54, a seat 56 and a front shield 58 are provided in a cabin of a vehicle. On the lower face of the instrument panel 50, there is

mounted an air bag device 60. The air bag device 60 is constructed to have an air bag folded in a casing and to have a gas generating inflater attached to the casing. When the inflater is energized, the air bag is extended to tear the front side of the casing until the air bag 62 is extended to the front of the seat 56.

The air bag device 60 is located in a position offset rightward from the front of the central portion of the seat 56 thereby to leave a wide space around the knees of the occupant seated on the seat 56.

Alternatively, the air bag device 60 may be arranged either in front of the central portion of the seat 56 or at the lefthand side of the front of the center.

As seen from Figs. 13 and 14, the air bag 62 is formed at its two ends in the widthwise direction of the seat 56 with projections 62A and 62C projecting toward the seat 56. In other words, the air bag 62 is formed in front of the center portion of the seat 56 with a recess 62B which is recessed away from the seat 56.

With this air bag extension shape, as seen from Fig. 14, if the knees 66 and 68 of an occupant 64 are thrown toward the air bag 62 at the time of a vehicular collision, they are received by the recess 62B so

that they can be prevented from being deflected to the right and left. Moreover, since the occupant's knees 66 and 68 are held by the air bag 62 without fail, they can be prevented from being thrown to hit the door or the console box 54 of the automobile. It is quite natural that the occupant has his body held and protected without any offset by the center portion of the air bag 62.

According to the present invention, the degrees of restraint upon the lefthand knee 66 and righthand knee 68 of the occupant can be equalized by increasing the volume of the air bag at the vehicle center (i.e., the projection 62C) in which a larger space is provided in the vehicle cabin.

Although the foregoing embodiments exemplify the air bag device for the driver's seat, the present invention can also be applied to an air bag device for a passenger's seat.

According to the air bag device for the knees of an occupant of the present invention, as described above, it is possible to protect the knees of the occupant. Since the air bag device of the present invention is disposed in a position offset rightward or leftward from the front of the seat center, the space around the knees of the occupant of the seat

can be widened to improve the comfort of the vehicle cabin.

According to the air bag device of the present invention, the air bag has such a high transverse extension rate that it can be quickly extended to the zone in front of the knees of the occupant at an emergency such as collision of the vehicle even if the air bag device is arranged in the position offset from the front of the seat center.

According to the air bag device of the present invention, the occupant can be prevented from having his legs parted when they are thrown to the extended air bag. Moreover, the occupant can have his body held at the center of the air bag.

WHAT IS CLAIMED IS:

1. An air bag device for the knees of an occupant, comprising:

an air bag adapted to be extended in front of a seat of a vehicle including a zone at a height of the seat;

a casing which holds said air bag therein in a folded state; and

a gas generator mounted on said casing,

said casing being located in a position offset to one of the righthand and lefthand sides of the front of the center of the seat, and

said air bag having such a volume as to be extended to the other side by said gas generator.

2. An air bag device according to claim 1,

wherein said air bag has a transversely long expandable shape and is formed at its back at one of transverse ends thereof with an opening for accommodating said gas generator,

wherein said air bag has upper and lower edges of a longer side folded toward the front thereof, and

wherein the other transverse ends folded toward said one of transverse ends.

3. An air bag device according to claim 1, wherein said air bag takes, when extended, a shape, in which its two end sides in the widthwise direction of the seat have projections toward the seat so that the knees of the occupant may be received between said projections of the extended air bag, when the legs of the occupant are advanced at the time of a vehicular collision.

4. An air bag device for the knees of an occupant, comprising:

an air bag adapted to be extended in front of a seat of a vehicle including a zone at a height of the seat;

a casing which holds said air bag therein in a folded state; and

a gas generator mounted on said casing,

said air bag having a shape when it is extended fully, in which its two end sides in the widthwise direction of the seat have projections toward the seat.

5. An air bag device according to claim 4, wherein said air bag receives the knees of the occupant between said projections when the legs of the occupant are advanced at the time of a vehicular collision.

6. An air bag device substantially as hereinbefore described with reference to the accompanying description and either Figures 1 to 11; or 12 to 14 of the drawings.

**Patents Act 1977**  
**Examiner's report to the Comptroller under**  
**Section 17 (The Search Report)**

Application number

GB 9300368.9

**Relevant Technical fields**

(i) UK Cl (Edition L ) B7B (BSB)

(ii) Int Cl (Edition 5 ) B60R

**Search Examiner**

PAT EVERETT

**Databases (see over)**

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

**Date of Search**

22 FEBRUARY 1993

Documents considered relevant following a search in respect of claims 1-3

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
Y	GB 2250963 A (TAKATA) Figure 6	3
Y	GB 0953312 A (KENT) note bag 1 in Figure 2	3
X,Y	US 4262931 A (STRASSER) Figure 2, note knee bag 21	X: 1 Y: 3

Category	Identity of document and relevant passages	Relevant to claim(s)

### Categories of documents

**X:** Document indicating lack of novelty or of inventive step.

**Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category.

**A:** Document indicating technological background and/or state of the art.

**P:** Document published on or after the declared priority date but before the filing date of the present application.

**E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.

**&:** Member of the same patent family, corresponding document.

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